**Name:** Abhay Mathur **SAPID:** 60017210016  
**Batch:** A1

**Experiment No. 5A**

**Aim:** Feature Detection in Images

**Objective:** Develop a program to detect features in an Image (Edge)

**Theory:**

Image feature extraction involves identifying and representing distinctive structures within an image. Reading the pixels of an image is certainly one. But this is a low-level feature. A high-level feature of an image can be anything from edges, corners, or even more complex textures and shapes.

Features are characteristics of an image. With these unique characteristics, you may be able to distinguish one image from another. This is the first step in computer vision. By extracting these features, you can create representations that are more compact and meaningful than merely the pixels of the image. It helps further analysis and processing.

An edge is defined as a gradient on the pixel intensity. In other words, if there is an abrupt color change, it is considered an edge

The Laplacian filter comes under the derivative filter category. It is a second-order filter used in image processing for edge detection and feature extraction.

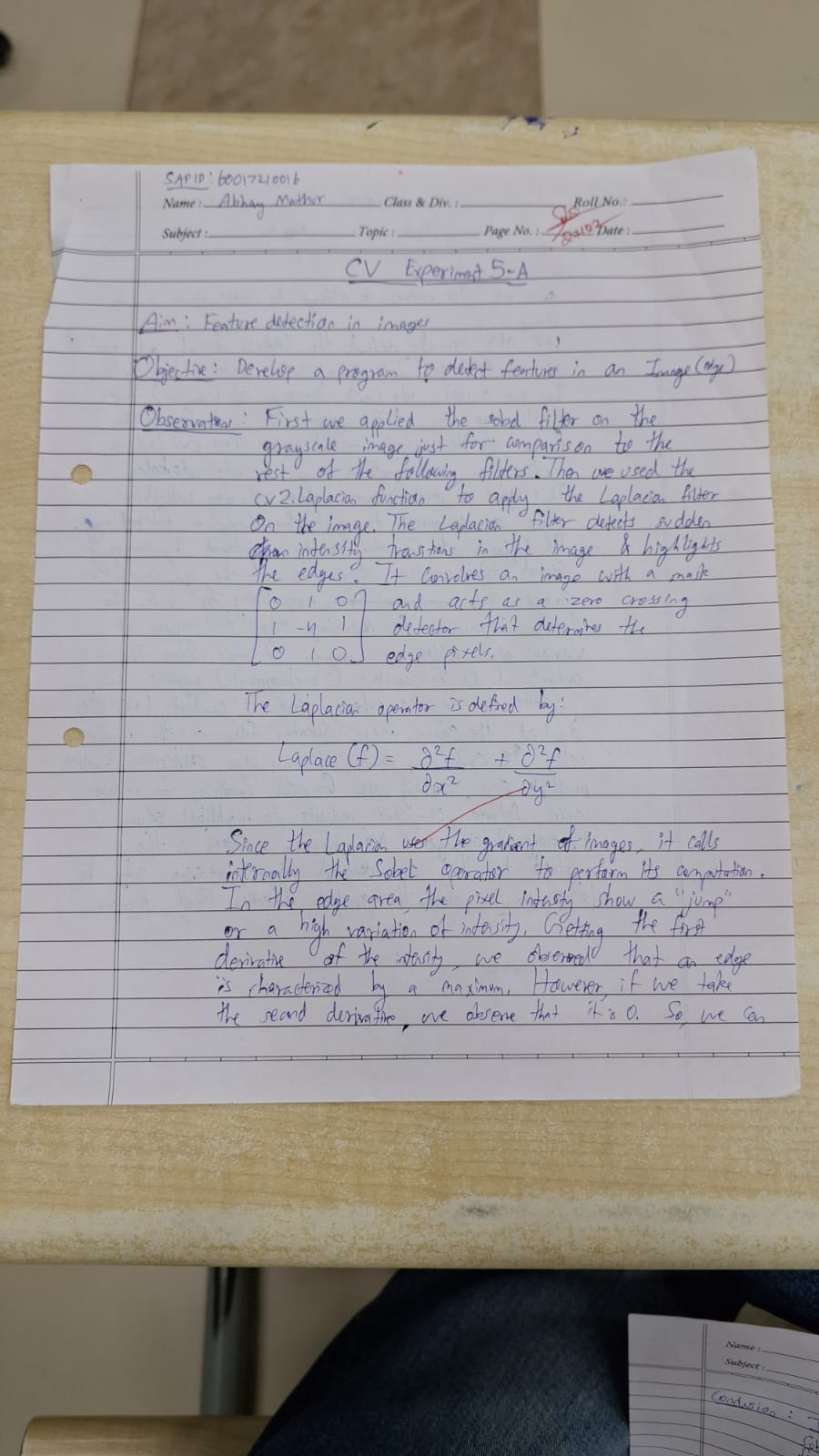
**Problem Definition**

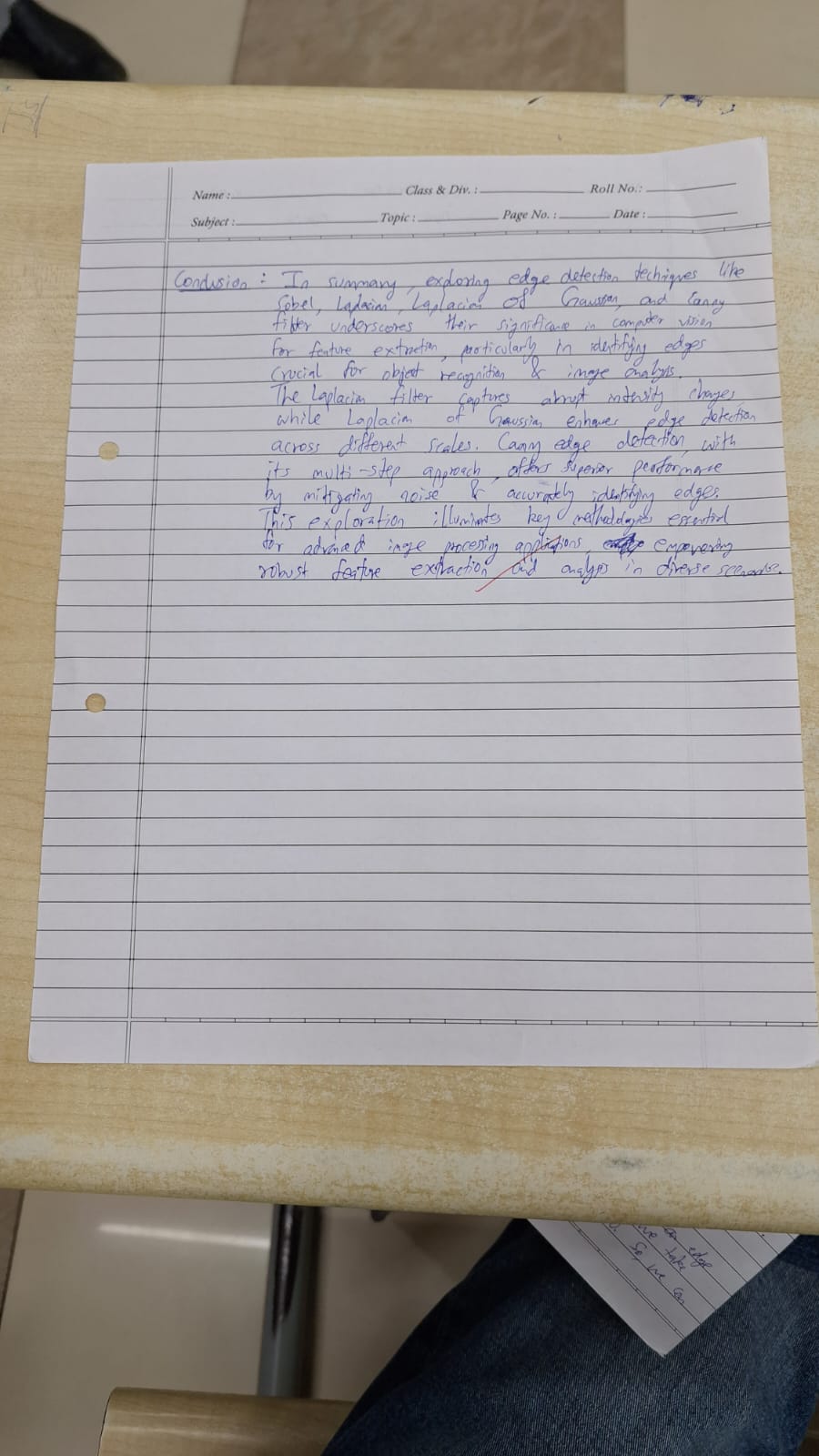
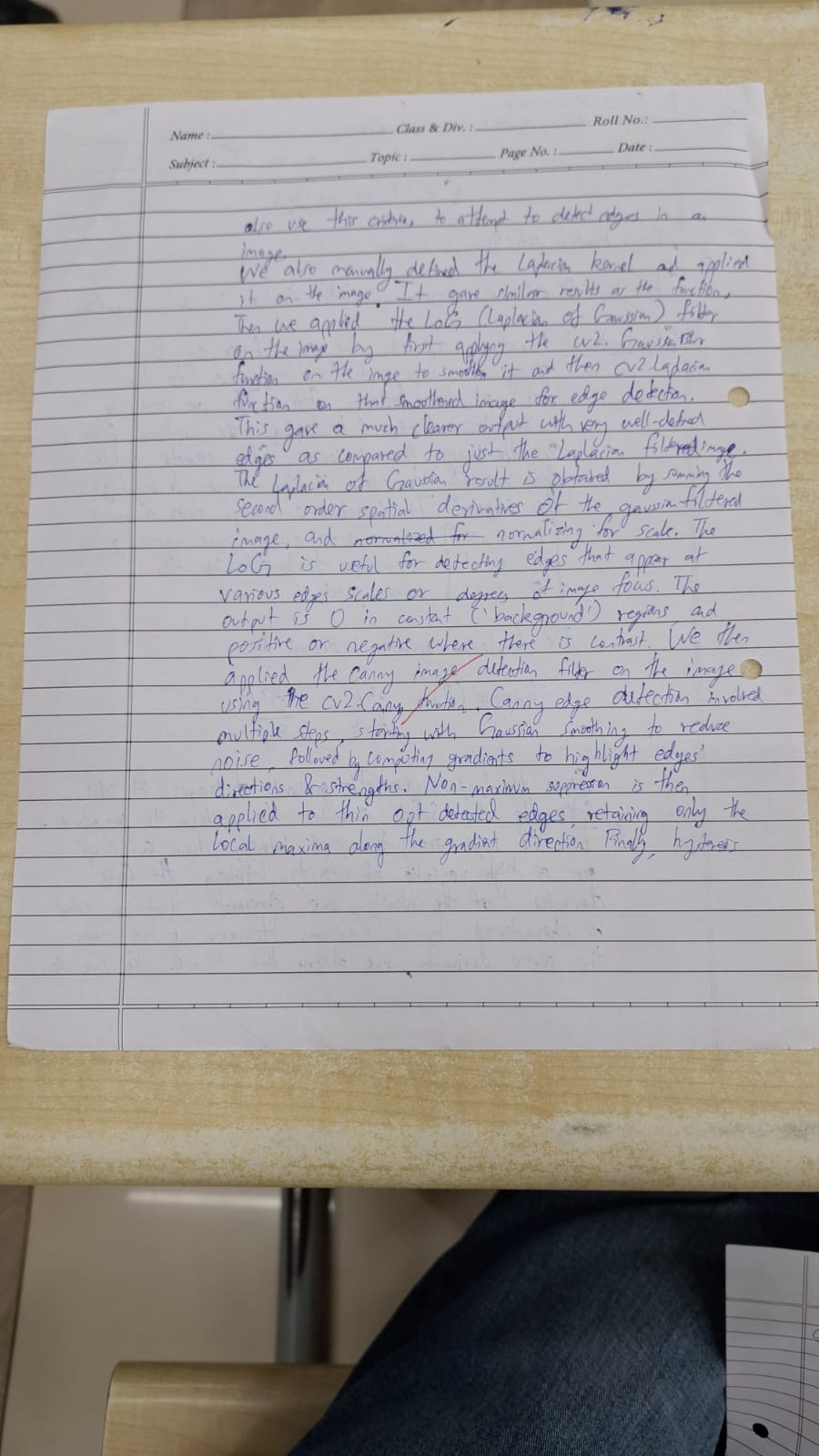
* Edge Detection (Sobel-x, Sobel-y, Sobel-Combined)
* Edge Detection using Laplacian
* Edge Detection using Laplacian of Gaussian
* Edge Detection using Canny Filter
* Compare Results

**Post Lab Question**

Explain Laplacian, Laplacian of Gaussian, Canny Edge Filter. Explain Canny Edge Filter Algorithm in detail

**Observations**

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**Conclusion**

In summary, exploring edge detection techniques like Sobel, Laplacian, Laplacian of Gaussian, and Canny filter underscores their significance in computer vision for feature extraction, particularly in identifying edges crucial for object recognition and image analysis. The Laplacian filter captures abrupt intensity changes, while Laplacian of Gaussian enhances edge detection across different scales. Canny edge detection, with its multi-step approach, offers superior performance by mitigating noise and accurately identifying edges. This exploration illuminates key methodologies essential for advanced image processing applications, empowering robust feature extraction and analysis in diverse scenarios.